University of Central Punjab

Faculty of Information Technology

Data Structures and Algorithms
Spring 2022

Lab 11	
Topic	• Trees ADT • Binary Search Tree (BST) • Recursion
Objective	The basic purpose of this lab is to practice the insertion of BST and traversal of BST

Instructions:

- Indent your code.
- Comment your code.
- Use meaningful variable names.
- Plan your code carefully on a piece of paper before you implement it.
- Name of the program should be same as the task name. i.e. the first program should be Task_1.cpp
- **void main() is not allowed. Use int main()**
- **You have to work in multiple files. i.e separate .h and .cpp files**
- **You are not allowed to use system("pause")**
- **You are not allowed to use any built-in functions**
- **You are required to follow the naming conventions as follow:**
    - **Variables:** firstName; (no underscores allowed)
    - **Function:** getName(); (no underscores allowed)
    - **ClassName:** BankAccount (no underscores allowed)

Students are required to complete the following tasks in lab timings.

Task 1

Create a C++ generic abstract class Node

Attributes:

1. Type data;
2. Node * left_child;
3. Node * right_child;

Functions:

- Write parameterized constructor with default arguments for the above class.
- Write Copy constructor for the above class.
- Write Destructor for the above class.

Task 2

Create an abstract class tree using the node class created in Task 1:

Attributes:

1. Node *Root

Functions:

- **Virtual void insert_node(Type value) =0;**
  This functions inserts a node in the binary search tree
- **Virtual void Print_inOrder()= 0;**
  This functions traverse and prints all the values of binary search tree the tree in order method
- **Virtual void Print_PostOrder()= 0;**
  This functions traverse and prints all the values of binary search tree the tree post order method
- **Virtual void Print_PreOrder()= 0;**
  This functions traverse and prints all the values of binary search tree the tree pre order method
- Write parameterized constructor with default arguments for the above class.
  - Write Copy constructor for the above class.
  - Write Destructor for the above class.

Task 3

Create a class BST by using the abstract class created in Task 2. Override already declared virtual method "Insert_node()" according to BST and also implement other virtual methods.

Attributes:

1. Node *Root

Functions:

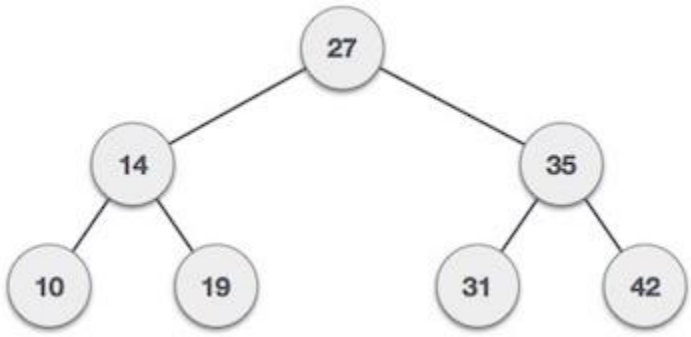
- **Bool is_Bst_Empty( )**
  This functions check whether the binary search tree is empty or not

- Write parameterized constructor with default arguments for the above class.
  - Write Copy constructor for the above class.
  - Write Destructor for the above class.

Binary Search Tree:

A Binary Search Tree (BST) is a tree in which all the nodes follow the below-mentioned properties −

- The value of the key of the left sub-tree is less than the value of its parent (root) node's key.
- The value of the key of the right sub-tree is greater than or equal to the value of its parent (root) node's key.



(a) Inorder

(Left, Root, Right):10 14 19 27 31 35 42

(b) Preorder (Root, Left, and Right): 27 14 10 19 35 31 42

(c) Postorder (Left, Right, and Root): 10 19 14 31 42 35 27